# HRM 747 – Advanced Methods in Evidence Synthesis

**Course objectives**

The overall objective of this course is to fill a methodological gap in the training of our HRM students. Students who successfully complete the course will have knowledge and skills to:

1. Design and conduct complex evidence synthesis projects
2. Apply advance methods as well as emerging meta-analytic techniques to address a wide range of clinical and scientific research questions using different study designs (e.g., randomized trials, observational studies, prognosis and prediction models) and outcome types (e.g., binary, continuous, count, time-to-event, etc.)
3. Use statistical packages (in Stata and R) for meta-analysis and network meta-analysis
4. Use GRADE methodology to evaluate certainty of evidence and draw appropriate conclusions from different meta-analytic methods for different research questions
5. Structure and write a research report containing meta-analysis and network meta-analysis results

**Prerequisites**

1. HRM 743, and at least two of the following: HRM 730, HRM 751, HRM 777, or permission of instructor
2. An approved 1-page project outline 4 weeks prior to the course

**Course tutors and lecturers (to be updated)**

Dr. Behnam Sadeghirad (Course coordinator), Dr Lehana Thabane, Dr. Gordon Guyatt, Dr. Lawrence Mbuagbaw, Dr. Farid Foroutan

**Educational Methods/Course Format**

The course will include three main components: Readings, lectures, and hands-on exercises. Prior to each session students will receive selected readings. The first half of the session will be a lecture, followed by a hands-on exercise to be completed in class.
The course will accommodate a maximum of 15 students.
Students are expected to submit a 1-page description of a meta-analysis topic that they either already have extracted data for or expect to finish data extraction by the time the course starts. The topic can be for prognostic, or dose-response meta-analysis, trial sequential analysis, or

network meta-analysis. Course instructor will assess the feasibility of suggested projects and will offer alternative projects or sample datasets in case students project would not be feasible to finish within the course timeframe. For the final session, students will present results of their projects in class.

**Course Text/Materials**

Core textbooks for general reading

- Christopher H. Schmid, Theo Stijnen, Ian R. White. *Handbook of Meta-Analysis*. First edition, 2020 Chapman and Hall/CRC. https://doi.org/10.1201/9781315119403
- Tom M. Palmer and Jonathan A. C. Sterne. *Meta-analysis in Stata: An updated collection from the Stata Journal*. Second Edition, 2016 Stata Press. www.stata.com/bookstore/meta-analysis-in-stata
- Sofia Dias, A. E. Ades, Nicky J. Welton, Jeroen P. Jansen, Alexander J. Sutton. *Network Meta-Analysis for Decision Making.* 2018, Wiley. https://doi.org/10.1002/9781118951651
- Julian P.T. Higgins, James Thomas, Jacqueline Chandler, Miranda Cumpston, Tianjing Li, Matthew J. Page, Vivian A. Welch. *Cochrane Handbook for Systematic Reviews of Interventions.* Second edition, version 6.1 (updated September 2020). Cochrane, 2020. Available from: www.training.cochrane.org/handbook.
- Michael Borenstein. *Common mistakes in meta-analysis and how to avoid them*. 2019 Biostat, Inc.

**Evaluation of Student Performance**

Students' performance will be evaluated based on:

**Participation and completion of hands-on exercises:**
During sessions 2 to 11, students will be expected to complete a hands-on exercise to demonstrate practical knowledge of the material covered. Students will be marked based on their participation in the tutorial session and hands-on exercise.

**Final assignment (course paper):**
Students will select one of the topics in the course (prognostic, or dose-response meta-analysis, trial sequential analysis, or network meta-analysis) and complete analyses based on their suggested dataset or a dataset that will be provided to them. Student-owned topics and datasets must be approved by the instructor. A written report on statistical methods used,

meta-analysis findings, and the interpretation of the results for the selected topic not exceeding 15 pages, double-spaced, 12-point font with 1-inch margins.

**Final presentation: 35%**

The final presentation should go over topics covered in the final paper. The presentation should not exceed 10 minutes and should leave at least 5 minutes for discussions and comments.

**Topics**

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| Session 1 | Course Overview and typology of systematic reviews and meta-analyses |
| Session 2 | Meta-analysis of interventions - Part I (statistical models and handling heterogeneity) |
| Session 3 | Meta-analysis of interventions - Part II (meta-regression, small-study effect, trim & fill modeling) |
| Session 4 | Meta-analysis of interventions - Part III (trial sequential analysis, IPD meta-analysis, multivariate meta-analysis) |
| Session 5 | Meta-analysis of observational studies and dose-response meta-analysis |
| Session 6 | Meta-analysis of prognostic studies and prediction models |
| Session 7 | Network meta-analysis - Part I (introduction and considerations) |
| Session 8 | Network meta-analysis - Part II (assumptions and model selection) |
| Session 9 | Network meta-analysis - Part III (GRADE and making conclusion from NMA) |
| Session 10 | Bayesian methods for meta-analysis and network meta-analysis |
| Session 11 | Handling missing participants data in meta-analysis and network meta-analysis |
| Session 12 | Final presentation |